A STUDY OF PHYSIOCHEMICAL PARAMETERS PRESENT IN GROUND WATER OF CHURU DISTRICT IN RAJASTHAN

A

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INTRODUCTION

Groundwater is a crucial resource for drinking, agricultural, and industrial purposes, especially in arid regions like Churu district, Rajasthan. The quality of groundwater is influenced by various physiochemical parameters, which determine its suitability for different uses. This study aims to evaluate the physiochemical characteristics of groundwater in Churu district.

A large area of Earth (71%) is covered with water but the availability of fresh water is very limited. India gets just 4 percent of water resources of the world, which is rapidly depleting and decreasing, due to increasing population pressure.

Rajasthan is one of the driest state located in 'Thar Desert' with negligible perennial surface water sources. Groundwater plays a vital role in demand and supply of water for various purposes. But the ground water of the state as well as the study area is in critical situation due to over exploitation (out of 237 blocks, only 32 blocks are considered safe with the ratio of groundwater exploration to annual replenishment reaching at a level of 125%).

There are a lot of contents found in water like fluoride, chloride, nitrate etc. in its natural state. But when these contents are above the desirable limit in the water, it becomes health hazardous and gives birth to many diseases like dental fluorides, skeletal fluorosis, blue baby syndrome, bone diseases etc.

Ground water of the study area which is used for drinking water is also affected with a high range of these contents above the permissible limit causing various health problems for local residents.

Churu District is a place of semi arid climatic condition with low rainfall and devoid of any perennial surface water sources. So Groundwater becomes very important for the fulfillment of requirement of people for drinking, But ground water in Churu District is also affected with harmful contaminants. Increasing population and over exploitation affecting the quantity of groundwater too.

Therefore drinking water is not potable in the sense as it is not free from harmful contents as directed by quality parameters. All these conditions creating adverse effect on the health of people.

1. Definition and Formulation-

Water is a chemical substance which is formed by the combination of hydrogen and oxygen gases in the presence of heat and light. Its chemical formula is H_2O. H_2O is

called light water in which protium, i.e. Isotopes of hydrogen are combined with O_2.

$H_2 + \frac{1}{2} O_2 \rightleftharpoons H_2O$

If deuterium is combined with O_2 than D_2O is formed which is called heavy water and used in industries basically in nuclear reactor. Mainly H_2O is known as water which is play an important role in our life and nature.

2. **Physical State and characteristic of Water**:- As we know that in nature, water is found in three physical state i.e. solid, liquid and gaseous states. Solid form of water is used as ice; liquid form is used as drinking purpose while gaseous state is used as steam or vapor. Nearly 71% part of earth surface is covered with water. This area of surroundings which covered by water is known as oceans. Nearby 97% of surface water is present in oceans, 2.4% water is present as glaciers, polar ice caps, lakes, rivers and ponds etc. while 1.6% of natural water is found under ground surface as aquifers while only 0.001% of water is present in the air as vapor. A very small amount of the earth's water is contained with in Icecaps, glacier, aquifers or in lakes some times providing fish water for lie on land.

Water is found in three Physical state- solid, liquid and gas. The solid form of water is known as Ice while the liquid form is known as water which is used in agriculture, industries and drinking purpose. The gaseous from of water is known as vapor.

Characteristic of Solid State (Ice):-

- In the solid state of water, H_2O Molecule arranged properly.
- H_2O molecules are bonded with strong attraction force.
- Solid form has certain shape and size.
- There is negligible distance between H_2O molecules.
- Solids are uncompressible.
- These are hard and rigid.
- Solid have fixed volume and geometry.
- The density of solids is very high.
- Solid shows only vibratory motion.

Characteristic of Liquid State (water):-

- In Liquid form of water H_2O molecules arranged improperly.
- H_2O molecules are connected by weak attraction force.
- Liquid state does not have fixed geometry.
- There is marginal distance between H_2O molecules so liquids are compressible.
- Liquids are soft and non-rigid.
- The volume of liquid is changeable.
- The density of liquids is less than solid.
- Liquid shows both vibratory and rotatory motion.
- Liquid can be converted in solid by highly compressed.

Characteristic of gaseous state of water (vapour)

Characteristic of gaseous state:-

- In the gaseous state of water H_2O molecules are arranged improperly.
- There are no intramolecular attractions forces between H_2O molecules because H_2O molecules are present at largest distance to each-other.
- Vapour state does not have any shape and size.
- Vapour state can be changed in liquid and solid state by highly compressed.
- Gaseous state is highly soft and non-rigid
- The vapour state has changeable volume.
- The density of gaseous state is very low.
- The H_2O molecule in vapour state shows translatary rotatory and vibratory motion.
- There is no fixed geometry of vapour state.

Distribution of water: - In water sphere near about 1318120000 Km^3 water is present in varous direction of atmosphere. Nearly 77.23% water is present in the form of Ice caps, 2.6% water (36020,000 Km^3) is present as fresh water, Ice bergs and glaciers while 22.41% water is present as ground water at 4 km deep in the earth. Thus on the earth water is distributed in following ways.

1. Oceans
2. Ground water
3. Surface water

1. **Ocean's water**: - Nearly 71% parts of earth is present as water which is 97.39% part is available as ocean water. Nearly 1,34,80,000,00 km^3 water is present in ocean.

Due to the largest quantity of water oceans are called water planet. But ocean's water is not use full for drinking purpose because it is highly salted.

2. **Ground water**:- The water present under the ground into the mountain's hole and crakes is known as ground water. It's quantity is controlled by rain quantity and speed, temperature, dryness of air, absorption capacity of soil. The percentage area of ground water is only 0.58% with respect to the total water resources while 22.21% of total pure water only 2.67% pure water is present on the earth. The ground water is present at 4km deep in the earth. Because the ground water is present under the ground so it is also called subsurface water. The name subsurface water is given to ground water because it is present under the surface of the earth.

Storage of ground water: - Ground water is storage under the earth in following threes zone:-

1. **Non saturated zone**: - The upper part of ground water is called non saturated zone. Since air is present in this zone hence it is also called zone of aeration. In this region water is present in only rainy season.
2. **Saturated zone**: - It is the mediatory zone of ground water. In this zone water comes from none saturated zone through link aging so water level increase in this zone. In saturated zone the water level is very high in Rainey season while very low in dry season. The middle part of above both levels is known as intermittent zone of saturation. While under this zone a specific saturated zone is present which is called zone of permanent saturation which remains always saturated. Saturated zone is also known as preatic zone.
3. **Rock flowage zone**: - Under the ground surface a specific region is present where rock hole is closed due to the increase of rock weight hence water does not seeps down. So water is storage here. This stored water is known as Aquifer. Aquifer water is present at 16km deep in the earth.

Surface water:-The water present on the surface of the earth is known as surface water. It is present in both stable and mobile forms. Surface waer basically distributed on continent part. The ⅔ part of surface water is present on Antarctica continent surface water is present on continent in the form of Ice. Ice covered areas are known as snow fields and glaciers. The part cited above snow line which covered always Ice is called snowfields. While a huge mass of Ice cited above snow line and remains labile due to the graviting force is called glaciers.

REVIEW OF LITERATURE

Gupta et. al (1999) studied the management of high nitrate wastes in Nagaur district and results indicated that ground waters not only saline but also rich in other constituents particularly fluoride and nitrate. The severity of the problem is more acute in central and northern parts where more than 50 per cent wells investigated have nitrate more than 100 mg/1 which is the maximum permissible levels for drinking waters. Karle at el studied on the Physico-chemical parameters of Ahmednagar district and observed the seasonal changes in these parameters. They proposed their result that there are some drastic reasons for high level of nitrate that are agricultural fertilizers, sewage water, decaying plant debris. Since in Nagaur there are no suitable method for decaying of plants debris, treatment of waste water and chemical fertilizers. Since a lot of amount of nitrate ion is present in waste product of plants, fertilizers and factories. In the absence of separation of nitrate ion from these waste, the level of this ion in water bodies increased.

Kumar et. al (1999) found a relationship between fluoride, total hardness and total alkalinity in the ground water of Barmer district. They recorded 6.56% samples having fluoride below the permissible limit of 0.5 ppm and 36.08% samples had fluoride above the permissible limit of 1.5 ppm.Kumar at al choosed the samples from highly saline ground water and analyzed them. After the analysis they find out direct or inverse relationship between some water parameters such as total alkalinity, fluoride and total hardness which aries due to calcium as a results. Since Barmer is a desert area of rajasthan where the amount of rain is very low. Hence the water level is very deeped in Barmer. Due to the deeped level of water the fluoride content present in excess in water because in depth of earth there are present a lot of granite rock which is made of fluoride. When we receive the water from depth of the earth than this fluoride content comes out from ground surface of the earth thus the level of fluoride content increase in water.

Biligrami et. al (1999) used quantitative and Qualitative indices for evaluating water quality of the Ganga. After the study of seasonal variations in water quality parameters of sampling water taking from river Ganga they concluded that water parameters not found in range which indicates the polluted nature of this river zone. Ganga river is a religious faith of people due to its connection with lord Shiva. People worship this river like God and taking bath in the river because their religious faith is

that on bathing in Ganga river all badness of people washed away. This religious faith of people is responsible for the pollution of Ganga river. The pollution level of this river reached on top level that is edge of death. The physiochemical parameters of water of Ganga river lies on death level. The water is greatly harmful for aquatic animals as well as human beings.

Ozha et al (1999) have been reported high concentration of nitrate in ground water which was increased with total hardness calcium and magnesium and decreased as the depth of water table increased in ground waters of Churu and Barmer districts. Ozha and Jain(6) (1993) observed the 80% cases of water borne diseases are due to contaminated waters with nitrate and fluoride in Churu, Nagaur, Barmer, Jalore and Bikaner districts. These districts are lies in dark zone due to the lacking of rain. There are big lacking of water for agricultural, drinking and other domestic uses. The water which is available for uses are also suffering from high concentration of nitrate ion. This ion is responsible for death by methaemoglobinaemia in adults and by blue baby disease in new born baby. The high concentration of nitrate arises by excess use of chemical fertilizers containing nitrate ion in agriculture

Gupta and Sharma et al (2000) studied the Quality of water at Laltappar an industrial area of down valley and observed that concentration of calcium magnesium and phosphate were found above the permissible limit in natural waters. The river and canal water confirmed the increased pollution due to industrial development. Since the study area is industrial region hence a lot of industrial waste product is released in water sources. As we know that the industrial waste has many poisonous metal ions which increase the level of water parameters. The mixing of business wastes from chemical industries, sewage and distinct waste and agricultural discharges into the water sources increase the pollution level in water. This industrial pollution in water is caused for decreasing the quality of physiochemical parameters present in water.

Pande and Soni (2000) studied the Physico chemical parameters of Naukuchia Taal lake water to assess the quality. It was observed that the lake water was highly polluted and contaminated with high amount of free CO2, total alkalinity and pH except dissolved oxygen gas. The high amount of carbon dioxide arise by decomposition and respiration. Carbon dioxide gas also released by oceans. The cement industries, deforestation and the complete combustion of fossil fuels also produce CO2 gas. The excess quantity of carbon dioxide gas in water forms carbonic

acid which decrease the level of hydrogen ion potential in water. This decrement in pH of water is caused for high alkaline nature of water. Pande and his friend has concluded that the water of Naukuchia Taal lakes is not good for drinking and domestic purpose due to the excessive level of CO2, TA and pH.

Sharma and Rajput (2000) studies were conducted on the water qualities of the Ganga sagar and Adhartal lakes of Jabalpur during 1991 to 1992 Nitrate-N and phosphate phosphorus concentration showed that the water of the lakes was sufficiently polluted by domestic and organic pollutants. Further high concentration of chloride, COD, BOD and other variables indicated high load of pollution. The study indicates that the high level of nitrogen and phosphorus contaminant arises by excessive uses of fertilizers in farming process. The high chemical and biological oxygen demand of water indicate that the water is highly polluted. In polluted water such types of bacteria are germinate which absorb oxygen gas in excess for respiration and their metabolic reaction. Due to this reason there are lacking of oxygen in polluted water.

Singh et al (2000) worked on surface off ground water quality of Kawar lake area, Bihar (India). The water samples were analyzed for the assessment of Physico chemical quality. Their study of drinking water was based on WHO as well as Indian standards. After the study of water sample of Kawar lake of bihar they concluded that some water indices are present in higher range as compaired to world health organization guideline. These water indices are electrical conductivity, calciumandmagnesium hardness. The deviation in electric strength indicates the presence of unrequired solid particles in water. The high level of EC arise by the mobility of solid particles. While the hardness of water indicates the presence of carbonates and bicarbonates of calcium and magnesium ion in excess.

Srivastava and Chaudhary et al (2001) studied drinking water qualities at Agra by examininig various physical, chemical and bacteriological water properties parameters likespH, EC TDS, DO, alkalinity, total hardness, chloride, fluoride, sulphate nitrate and coliform MPN at the consumers end in 22 selected residential areas. The study indicated that some modification and remedial step in the existing water supply are urgently needed because the water quality is unsatisfactory in most areas of the city. Since Agra is a historical place of India due to Tajmahal. Hence a number of visitors comes there to visit the Tajmahal. Due to the dense population of Agra the level of water as well as air pollution is very high. So there are big possibilities of acidic rain

which caused spoil shed the shining of Tajmahal which indicate towards the big level of pollution.

Aggarwal et al (2001) studied the effect of sewage on Veruna river water. They study the sewage water and found the presence of heavy metals as pollutants. They selected four sites along the water of Veruna river. To know about the nature of these pollutants they proved that the presence of sewage pollutants increases the alkaline nature of river, temperature, hydrogen ion potential, biological and chemical oxygen demand, C1-, NO3-&Phosphates, K+, Ca+2& heavy metals contact. They analysed the water of veruna river before and after the mixing of sewage water in it and observed that there are a huge different between the level of parameters before and after the mixing of sewage in river. Before the mixing the level of parameters found in acceptable range but after the mixing this level was found in out of range. This deviation arise by those toxic element which are present in sewage water.

Sudhir Dahiya et al(2001) have been studies the level of fluoride content in ground water. As study area they choose seven villages of Tosham in Bhiwani district of Haryana. By the study of sampling water they concluded that 56% water samples shows higher fluoride range compared to WHO range of fluoride. This higher range of fluoride lies between 0.18 to 9.0 ppm. When they constructed a correlation diagram between fluoride, pH, EC and TA than fluoride gives negative correlation with pH while positive correlation with electrical conductivity as well as total alkalinity. The negative correlation with hydrogen ion potential indicates that on increasing the pH value of water the fluoride level decreased hence it shows negative correlation diagram with pH. On the other hand the positive correlation of fluoride with EC gives the result that the increasing value of electrical strength affect the fluoride content which was increased with EC hence positive correlation of fluoride was obtained. The same result was observed with respect to fluoride and total alkalinity of water.

Dubey et al (2001) have conducted a survey in that villages which are situated around the Malampur industrial areas to know about the quality of drinking water present in ground surface of the earth. On the basis of their study they give results that the values of standard parameters for drinking water are acceptable except few quality indices. Thus the water have some health significance. According to dubey the important constituent of life is water. In the absence of water no one can survive or dream to stay on earth. But now a day this constituent of life get polluted with increasing population. The to author nearly one thousand million of people still use

polluted water. So in the world a heap of children die every day by suffering from water disease which caused polluted water. According to author nearly four billion cases of diarrhea was come to notice in one year. Beside this two hundred million cases of schistosomiasis, three hundred ninety six cases of malaria and one hundred thirty three cases of intestinal helminthes infection was arise by using polluted water in per year.

Gyannath et al (2001) have been studied the effect of mass bathing on quality of water of Godavari river. For this purpose they select the eve of "Holi Mela" at Nanded at Godavari river. The analysis of sampling water of river Godavari gives results that the water is totally unfit for bathing and drinking purpose because the Godavari river was highly polluted due to mass bathing. According to Gyannath there are a meaningful change in water quality of Godavari river by the process of mass bathing. So the water of the river caused health hazardous of people which use the river water. The mass bathing event held on the occasion of Mahashivratri festival. During the festival million of people take bath in the river so there are a huge increasing in skin and faecal macrobiotic in river water. It is suitable for growth of bacterial population in water which damage the diversity of water. As a result a huge change was observed in quality of water of Godavari river.

Jain et al (2001) have discussed the fluoride content, its significance and its harmful effect on our body to create awareness among the people of the country. They suggested that the high level of fluoride content in our body create fluorosis disease. They gives general descryption of this problem that it is responsible for knee pain, weak bone and various teeth disease. They also provide the techniques for defluoridation of water. The defluoridation of water are based onadsorption, ion exchange, reverse osmosis, precipitation & electrochemical decomposition etc. Reverse osmosis is a process of water purification that is used as RO plant. This process is basically used for the purification of that water in which the level of total dissolved solids are lies above 500 milligram per litre. According to national green tribunal if the water have TDS level below five hundred milligram per litre than there is no requirement of reverse osmosis because in reverse osmosis process a big quantity of water become useless in the form of waste water.

Jha et al (2001) have been selected Godda region of Bihar for the study of drinking water to know about the range of water quality they found that most of the indice are present in standards permissible range of water parameters as guided by WHO and

ICMR. Well water was characterized by a very high concentration of C1-,Cr3+& Selenium quite above the standard limit, hence not suitable for drinking purpose. To assess the bacteriological outstanding of water for coliform, samples were taken from Godda region of Bihar. The analytical study of samples represent that 40.9% samples had been located at different line of WHO. It means that the water of Godda region is not good for human consumption. Since the 47.6% samples were taken from submersible pumps while 47.3% water samples were taken from water tanks. These water resources are prone and more uncovered to contamination.

HO, K.C. et.al.(2001) have been studies the chemical nature of the Dongjiang river and its effect on the Pearl River Delta which is under the process of development. This study has shown the Physicochemical quality of Ochaja natural spring water was within the limits of guidelines for potable water. However, the bacteriological quality of the spring fell short of the requirement. Fecal coliform observed throughout the period of sampling is a cause for concern as this may become a source of water borne disease. Therefore, it is advisable the spring water is treated before consumption in order to avoid outbreak of water borne disease.

Kaur H.et.al. (2001) represent a study on hydro biological nature of Basantar river which flow in Samba district of Jammu in Jammu and Kashmirstate. As we know that the productivity of a river is controlled by physio-chemical parameters. To understand the biological and physio chemical condition of river it is very necessary to manage the water body. The changement in water body contamination like heat, humidity, light and various effluents etc play an important role for controlling the aquatic environment of the river. On the basis of above studies they proposed a result that the values of various physico-chemical parameters are found in range in all three different seasons like summer, monsoon and winter. The obtained result indicates that the water of Dwarkeshwar river at bankura segment can be used both for drinking and fishing purpose..

Shyamala et al (2002) did the analysis of physic-chemical parameters present in sampling water of borewell of choosen study area. They select the Telungupalayam region in Coimbatore district in Tamilnadu as a study area. This study was carried out to explain the nature of water quality indice present in groundwater of the study area i.e Telunguplayam village in coimbatore city. The study shows that the range of most of the parameters such as TH, hydrogen ion potential, chloride ion, calcium and chemical oxygen demand etc. are lies in desirablelimits. But there is only two

parameters i.e TDS and alkalinity of water was found in higher concentration compared to the desirable limit. So the study indicate that there is needed some short treatment to minimize the higher concentration of TDS and alkalinity so that the water of Telungupalayam village is maked good for drinking as well as domestic uses.

Meenakshi, V. okay et.al (2002) have been checked the level of pollution in water and suggest the methods to eject the pollutants from water bodies. They focused their study on the use of adsorbent in water purification. It is useful method for removal of undiserable solids particles from water. Adsorbent is a substance which adsorb the pollutants on its surface. It is a surfacial action so we can easily remove the pollutants from the surface of adsorbent by heating and others simple methods. The study was basically based on the development of adsorbent and their uses in the removal of solid particles from drinking water. The study also indicates the level of uses of adsorbent for maintaining the quality of water. The process of adsorbtion also differ from absorbtion because absorbtion is a internal process whereas adsorbtion is takes place on surface area.

Kistemann T. et.al.(2002) have been studies the water of Gomati river in Jaunpur district in UP. They analyze that the water of Gomati river was very polluted due to the mixing of sewage water in it. The sewage water originate from domestic as well as industrial methods. During the study they found that the microbiological quality of river water is very poor so the biological and chemical oxygen demand may be very high. The pollution of the river was responsible for it. The pollution of river was arise by increasing population near the cis and trans sides of the river. On the basis of above study they concluded that the range of water parameters lies out from that level which was provided by WHO and ICMR thus the water is not good for drinking purpose of Gomati river.

Meenakshi, V. adequate. et al.(2002) have proposed the method of examine to quality of parameters present in water. They also used the adsorbent for elimination of unwanted particles from drinking and potable water. They also study on improvement of pollutant adsorbents and recorded their brilliant results to provide informations to explain how can we use the adsorbent in water analysis. During the study a lot of adsorbent was compared to each other so that the adsorbent with best quality can be used in study. The study tell us that there is needed to awareness of people about the uses of adsorbent to cleaning the water.

Meenakshi, V.K. et.al. (2002). The study of literature reviews was based on the objectives of the study which was related with the status of water quality, structure of adsorbent and their uses in the separation of unwanted particles from water. Meenakshi and their friends have been studies the water quality of western Yamuna canal which was flew from Tajeewala to Haiderpur treatment plant in Delhi. They incorporated the thinking of rural people about the water quality. There are present a lot of pollutants in Yamuna canal. These pollutants are reached in canal by sewage, by wastes products of human and animal excrement. When these polluted water is used in drinking and agriculture then these pollutants reached in our body and caused for various type of diseases such as dysentery, diarrhea etc. Some time we use the polluted water in food making process which caused infection in human being.

Chan et al (2002) studied microbiological & physicochemical quality of drinking water supplied in Klang valley in Malaysia. This study was carried out to know about the quality of drinking filtered water with respect to physico-chemicalas well as microbiological aspect. All water sample dose not found in regulations range of 103-104 cfu/ml for total plate count. The pH was slightly acidic compared to the range of regulations. They concluded that in filtered water all water parameters are present in permissible range so it is best for domestic as well as drinking uses. To obtain the data about environmental exceptional, the use of biomarkers in aquatic organisms is an effective approach. The capacity of pollutants to destroy the aquatic environment can be measured by the help of biomarkers. Further research can easily correlate the change in water quality with remarkable chemical stressors in water. The mechanism of toxicity in amphibian species can be introduced through insecticides.

Kavka, G.G.et al (2002) have been studies the microbial pollution of the Danube river and find out that the river is highly polluted. The status of pollution was observed by the help of bacteria which is ideal sensors for representing the microbial pollution of surface water bodies. Because these bacteria gives quick response according to condition of environment. The most important indicator bacterias are E. coli and intestinal enterococci. These bacteria tell us about the energetic presence of pathogenic viruses, bacteria and parasites and gives information about that pollution which aries due to raw and treated sewage and also diffuse its impacts on agricultural land. The organic pollution of water is aries by heterotrophic bacteria. To protect the Danube river from these type of bacteria they study the research report of the International Commission which suggest the way of Protection for the Danube river.

In Danube countries JDS offered a uniform methodology for analysis of microbiological parameters. The analysis of these parameters is made obligatory by legislation.

Chaturvedi S. et.al., (2003). They study the water of Ganga river in Haridwar to determine the Physico-chemical characteristic of flowing water of Ganga. The obtained result shows that water parameters are not in desirable limit and it is not good for the formation of flora and fauna. The present study revealed, the Physico-chemical quality of river Gomti is not reasonable. The parameters showed that the quality of water is not now in safe limit and not good for flora and fauna, so there is needed to handle thes ituation of alarming and degradation of waterquality. Hence for the improvement of water quality ,there is needed continuous monitoring of the pollution level and required immediate action for its better management.

Agarkar, S. V., et al (2003) have been study the drinking water of Chikhli village in Buldana district in Maharastra for the estimation of fluoride content. For the expression of overall water quality a single number was provided by WQI at a certain location and time. The objectives of WQI are that to make the data useful for public by converting the complicated water quality data into simplest information. However a water quality index based on some very important parameters can provide a simple indicator of water quality. In general by using WQI indice we can change multiple incorporate data into a mathematical equation that represent the rate of water body health with number. Some mineral ions such as Chlorides, Nitrate, Fluoride, Iron etc aries impurities in water. Bythe study of some major cationic parameters likes TDS, electrical conductivity, TH and hydrogen ion potential they concluded that the water of study area is good in quality so can be used for fisheries, drinking and other domestic purposes.

Sandeep Mitharwal et.al (2009) describes the important results of the Physico-chemical analysis of the ground water samples of the open wells, tube wells and hand pumps of the urban areas in Pilani, District – Jhunjhunu of Rajasthan State. The different parameters determined are pH, TDS, fluoride, chloride, nitrate, sulphate, total alkalinity and total hardness. It has been observed that nitrate values are higher compaired to ICMR standards. Other parameters were found within desirable limits. The interesting fact is that the nitrate alone is making ground water unfit for drinking

Ranjana Agrawal (2009) Studies of Physico-chemical parameters of groundwater quality at Dudu town of Rajasthan have been taken up to evaluate its suitability for

domestics' purpose. 21 ground water samples were collected from different places of Dudu town of Jaipur district. The quality analysis has been made through the pH, EC, TDS, Dissolved Oxygen, BOD, COD, Total Hardness, Sodium, Pottassium, Calcium, Magnesium, Chloride, Sulphate, Nitrate, Fluoride and Alkanity. A systematic calculation of the correlation coffecient has also been carried out between different analysed parameters. Comparative studies of samples in different seasons were conducted and it was found that Electrical Conductivity and Total Dissoved Solids (TDS) were decreased. Alkanity and Total Hardness were increased after the rainfall. Studies in the area of Khetri Nagar were done and analysed the water from the wells5. It was found that fluoride contents from the wells from different sites to vary from 0.87 to 1.01ppm. The study carried out in the Dudu town on ground water samples conform that the pH level of ground water was within limit. In 13 samples were having Electrical Conductivity more than Maximum Permissible Limit. It is said that these water cannot be used for drinking purpose.

B.R.Kiran (2010) has studied the physico-chemical characteristics of the waters in two fish ponds , located near Bhadra project in Karnataka, which is the main water source for fish seed rearing and culture of brood fishes in this area. This study was carried out during December 2006 to May 2007. The physicochemical parameters like temperature, pH, acidity, total alkalinity, free CO2, dissolved oxygen, biological oxygen demand, chloride, sulphate, phosphate, nitrate, calcium, magnesium and total hardness were analyzed. The resultant values were compared with water quality standards suggested by WHO, BIS and USPHS. The high phosphate and nitrate content were indicated that to water gets polluted due to addition of cow dung and poultry manure to the ponds that is fish ponds are moderately eutrophicated .For proper growth of two fish ponds must provide a suitable environment. As precaution is better than cure, proper management should be necessary to prevent any chance of bacterial diseases.

A.K. Satone, et al (2011) studied water samples collected from the historical area; M.I.D.C. of Wardha (M. S.) has been carried out to examine its potability for domestic purposes. The physicochemical parameters were studied by using various analytical techniques. Sodium& Potassium were determined Flame photometrically. The parameters were analyzed & compared with standard values prescribed by American Public Health Association (APHA) & World Health Organization. In conclusion it can be stated that the different studied physico-chemical parameters

such as BOD, DO, COD exceeds WHO acceptable limit. Alkalinity, acidity, chloride, hardness, total dissolved solids, total suspended solid, pH, conductivity, sulphate, pathogen are within the permissible limit. The high value of BOD is an indication of the contamination and low oxygen available for living organisms in the wastewater. The present study concluded that majority of physico-chemical parameters of the quality of water samples were within acceptable limit. In order to overcome water pollution in MIDC area, Wardha remedial treatment is necessary to remove excess of hardness by boiling & ion exchange.

Objective

1. To assess the quality of water to ensure it is pure and wholesome for public consumption and other domestic purposes.
2. To determine if the water is suitable for specific industrial purposes; if not, to identify the most effective treatment methods.
3. To identify any pollution in a water source, trace the origin and extent of the pollution, and suggest possible remedies.
4. To evaluate the efficiency of natural purification processes when sewage and industrial wastes are discharged into water sources.
5. To assess the effects of heavy rainfall or prolonged drought on water quality.

NEED OF THE STUDY

Churu district is a district in the Rajasthan state of India. The district headquarters is in Churu, which is located about 200 km north of the state capital, Jaipur. It is a semi arid zone with respect to the presence of water. The availability of water is a major problem in this region.

Churu district was established by Chuhada Jat in 1620 AD. Later, it came under the rule of Rathore (Banirrot) Rajputs. After the battle of 1871, this region came under the dominion of Bikaner. At the time of India's independence, it was part of the princely state of Bikaner. In 1948, during reorganization, it was separated from Bikaner. On November 1, 1956, under full integration, Churu was given the status of a district.

Churu district, one of the driest regions in the country, has always faced water scarcity. Annual rainfall ranges from 100 mm to 800 mm on average, and groundwater is unavailable in many parts of the distrcit, even for drinking. Water issues in developing countries include scarcity of drinking water, poor infrastructure for water and sanitation access, water pollution, and low levels of water security.

Increasing population and urbanization are key factors creating pressure on land, water, housing, and other resources. This pressure has led to the over-exploitation of natural resources, particularly affecting water quality. The situation becomes even more critical when it concerns drinking water and its quality, reinforcing the need for sustainable development of water resources. Ensuring access to safe drinking water is a significant issue for health and development at national, regional, and local levels. The need for studying the spatial distribution of water quality arises from these pressing concerns and underscores the importance of water in our lives.

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Material & Methodology

The methods for chemical analysis and bacteriological examination of water samples used in this research are based on the guidelines provided by Trivedi, R.K. and Goel, P.K. (1984), APHA (1985), WHO (1984 Manual), Purohit S.K. (1986), Saxena M.M. (1987), and CHEO, INDIA & PHED, RAJ (1984).

Water Sample Collection: Water samples will be collected from villages surrounding Rajgarh (Sadulpur) town in Churu district. Four water supply zones have been identified, and 16 water samples will be randomly selected for chemical analysis. Samples will be collected from various sources including ground-level reservoirs (G.L.R.), consumer ends, taps, tube wells, pump houses, hand pumps, and surface water reservoirs.

MATERIAL AND METHODS FOR CHEMICAL ANALYSIS

pH Scale:

pH is the logarithm of the hydrogen ion concentration with a negative sign ($pH = -\log [H^+]$).

pH will be measured in the field using narrow-range pH indicator strips and further confirmed in the laboratory using a pH meter within one hour.

ALKALINITY:

Alkalinity measures the capacity of the water sample to neutralize acids and is due to bicarbonates, carbonates, and hydroxides.

Phenolphthalein and methyl orange alkalinities will be determined using acid titration. Phenolphthalein alkalinity is measured by titrating with 0.1N HCl until the sample becomes colorless. Methyl orange alkalinity is measured similarly, with the end point being when the solution changes from yellow to orange.

WATER HARDNESS:

Total Hardness: Total hardness is the sum of the concentration of alkaline earth metals like calcium and magnesium, expressed as $CaCO_3$. It will be determined using the EDTA titrimetric method.

Calcium Hardness: Measured using EDTA titrimetric method with a NaOH solution and murexide indicator.

Magnesium Hardness: Calculated by subtracting calcium hardness from total hardness.

Carbonate and Non-Carbonate Hardness:

Determined by subtracting alkalinity values from total hardness values, expressed as calcium carbonate.

CHLORIDE:

Determined by Mohar's titration method using K_2CrO_4 as an indicator and titrating with 0.02

N $AgNO_3$. The presence of chloride is indicated by a color change from yellow to brick red.

NITRATE:-Determined using the phenoldisulfonic acid method.

IRON:-Measured using the spectrophotometric method.

FLUORIDE:-Determined by the Alizarin Photometric method.

TDS (Total Dissolved Solids):-100 ml of the well-mixed sample is filtered and evaporated. The residue is dried at 180°C and weighed. The TDS is calculated using the formula: TDS (mg/l)=(mg of residueml of sample)×1000\text{TDS (mg/l)} = \left(\frac{\text{mg of residue}}{\text{ml of sample}}\right) \times 1000TDS (mg/l)=(ml of samplemg of residue)×1000.

MATERIAL AND METHODS FOR BACTERIOLOGICAL EXAMINATION OF WATER

Culture Media:

Double strength MacConkey broth will be prepared for the enumeration of coliform bacteria. It includes peptone, lactose, sodium chloride, and bile salt. The media is sterilized in an autoclave and used to culture water samples.

Dilution of Samples:

Dilutions are prepared using blank water and adjusted according to the source of the samples.

Method of Analysis:

The Multiple Tube Dilution (MTD) method will be used. A series of tubes containing MacConkey broth will be inoculated with water sample portions

Recording of Most Probable Numbers (MPN):

Results will be compared with the McCrady probability table to record the most probable numbers of coliforms in 100 ml of water samples.

1. Primary & secondary data will be used in the present study.
2. First hand information will be collected through questionnaire.
3. The source of secondary data would be topographical sheets, gazetteer, and census handbook and statistical Abstracts book.
4. The data from PHED would be base sources to determine the spatial quality of Potable water in the study area.
5. The chemical analysis of few randomly selected water sample collected from be study area will be done to corroborate the results.
6. Different quality index maps to show the quality of water in the study area will be

prepared with the help of different cartographic method & computer based GIS software's.

7.The maps prepared through these techniques will show the spatial pattern of quality of quality of potable water.

8. Different statistical techniques will be used to present different socio economic data in proper manner.

9. Correlation and percentile analysis would be used along with weight score method for prepare water quality index.

10. Statistical diagram like Bar, Pie & graph would be helpful to represent population and climatic data properly.

WORK PLAN

1st Year

- Completion of PhD course work
- Review of literature
- Identify research Problem
- Formulate Objective, Hypothesis, Research Methodology
- Prepered Synopsis

2nd Year

- Presentation of synopsis
- Review of literature of related topic
- Pilot study
- Data collection and Analysis
- Tabulation and interpretation of data
- Chapterization of thesis prepared
- Summary of thesis

3rd Year

- Summary submission to university
- Finalized thesis
- Attended and presented paper in Conference
- Publication of paper in reputed journal
- Checking thesis for plagiarism
- Present pre thesis viva
- Hard binding of thesis and submission to university.

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